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ABSTRACT

The development and initial standardization of a two-part geography assessment test designed to measure student knowledge and understanding at the secondary level is the focus of this study. Intended to provide information about groups of students rather than to assess individual students, Part 1 of the test measures geographic skills and a knowledge of cultural geography, while Part 2 measures a knowledge of physical geography and location recall skills and knowledge. In order to establish baseline data for the geography assessment test, 1,560 students were tested on Part 1 and 1,617 students were tested on Part 2 during March 1985. Each of 18 specific geography objectives were measured by having students respond to 4-17 questions related to the specific content objectives. The results of the test suggest that the test questions were on the whole somewhat difficult in that the overall student average on Part 1 was 69 percent and on Part 2 the average was 57 percent. Student performance was highest on questions related to cultural geography and, except for using scales to measure distance area, overall test score percentages were fairly consistent with other available national research data measuring geography knowledge. Objectives selected to measure geographic understanding are presented, along with a performance analysis report, recommendations, and content specifications and sample questions for each objective. A student questionnaire concludes the paper. (LH)

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ASSESSING GEOGRAPHIC KNOWLEDGE AND SKILLS OF WISCONSIN SECONDARY STUDENTS (Preliminary Data)

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A paper presented at the annual meeting
of the
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ASSESSING GEOGRAPHIC KNOWLEDGE AND SKILLS OF WISCONSIN SECONDARY STUDENTS

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Change is in the wind! Social forces and pressures outside education have and are forcing educators to examine thoughtfully virtually all aspects of education from the pre-school years through college graduation and lifelong learning. Concerns are expressed about student learning and achievement; course goals, objectives, and content; intellectual and social skills development; and teacher accountability to suggest only a few. No discipline and/or academic content area is immune to these and other such pressures. The discipline of geography is no exception and must examine critically its responses to outside pressures. For example, on a somewhat regular basis, the evening news and local press remind us that citizens both young and old, cannot locate certain specific places on maps with any degree of accuracy. (Schodolski, 1984, Wise, 1975) This naturally leads to questions such as "why don't students know this information?" and "what kind of geography, if any, is being taught in our schools?"

Geographers and geographic educators in Wisconsin and elsewhere are attempting to respond in various ways to these concerns and less than positive images. One response in Wisconsin has been to incorporate a strong geography theme (including map skills) throughout the entire K-12 Social Studies Curriculum Planning Guide now in preparation. The Guide also recommends that an advanced geography course be offered at the secondary level. Another response of Wisconsin's geographers and geographic educators has been the development and initial standardization

of a two-part geography assessment test by Wisconsin Pupil Assessment Program which is intended to measure student knowledge and understanding at the secondary level. The test is not a test to assess individual students, but to provide information about groups of students, which in this case are twelfth grade students in Wisconsin public high schools. The test has been designed to find out what geographic information and skills students have and do not have. Part I of the test, measures geographic skills and a knowledge of cultural geography, while Part II of the test measures a knowledge of physical geography and location recall skills and knowledge. A number of the questions are written specifically to measure students knowledge of Wisconsin geography and geographic characteristics.

Established by legislative mandate in 1971, the Pupil Assessment Program was organized to provide three types of information related to 1) a measurement of student performance in selected academic areas, e.g., geography, science, economics, United States government, writing, etc., at one or more grade levels; 2) a comparison of Wisconsin student performance to a national average in mathematics, reading, and language; and 3) a description of changes in student performance over a period of several years. The results of the tests are communicated to the governor, legislature, and the public. In addition, the data from these assessments provide an overall general direction for local curriculum development efforts and have implications for classroom instruction. These data also provide benchmark information used to construct a basic profile of how well Wisconsin public school students perform selected important skills. When examining data from the statewide tests it is important to remember that student scores from a single test cannot be used to

evaluate the total educational program in Wisconsin. It is also well to remember that these test scores represent an estimate which means that if all the students had been tested, the test scores may have been somewhat different. For example, scores on the geography objective-referenced test may vary by as much as one or more percentage points.

Following previously established assessment practices to obtain valid and reliable information necessary to measure student educational achivement, a two-step sampling process is used rather than testing all students at a given grade level or in a specific subject/skills area. The first stept of this process involves selecting representative public schools based on geographic location, district size, and grade enrollment. The second step of the process involves selecting a random sample of students within each of these schools for testing. After scoring, the test scores are then returned to the schools and no attempt is made to compare districts, schools, or individual students on the basis of a single test. There is a high probability that the student sample is reasonably representative of the twelfth grade high school population in Wisconsin. In order to establish baseline data for the geography assessment test, 1560 students were tested on Part I and 1617 students were tested on Part II from among some 60,000 seniors during March 1985. Different students were involved in establishing the baseline data for each part of the test. Background information related to previous or current experiences in learning geography and attitudes concerning geography were also gathered at the time the test was administered. These latter data are awaiting detailed analysis.

A multiple choice format was determined to be most suitable because it allowed for testing of factual knowledge, skills, and reasoning ability since multiple choice items can be written to test for definitions; statements of purpose; identification of cause, effect, or association; recognition and identification of errors; evaluation of alternatives; finding differences, similarities, or commonalities; reorganizing sequences; skill competencies; and for comprehending the nature of arguments in a controversy. Thus well written multiple-choice questions can assess student knowledge of geographic concepts, skills and applications at fairly sophisticated levels.

The Wisconsin objective-referenced geography test was developed after it was decided not to use the National Council for Geograph Education test. For a variety of reasons, this test was deemed to be not suitable since it did not measure the precise objectives and content Wisconsin geographers and geographic educators wanted to measure. The test development committee of Wisconsin educators included college/university geographers, secondary geography teachers, measurement specialists, teacher educators, and representatives from the Department of Public Instruction. Pilot tests were administered during 1984 and on the basis of this field testing the questions were deleted, revised, or retained as appropriate to the pilot test data. The final selection of questions was determined on the basis of the field testing. Clearly the development of the geography test involved a rigorous and systematic developmental process.

The test has content validity in that professional geographers and geographic educators designed the test, while other professional geographers and geographic educators examined the content of the test for relevance, correctness, and general educational level. Reliability of the test has been established through pretesting of questions on a pilot basis, and the preparation of specific standard procedures regarding the administration of the test. Those who constructed the test made every effort to ensure the currency and accuracy of information posed in the questions and their responses. Efforts were made to avoid carelessness in constructing the test. One can assume the assessment results are bias free since the test was developed by impartial educators.

The final test was written to measure 18 specific geography objectives. Part I consisted of 61 test items while Part II consisted of 90 test items. (See Appendix A for objective specifications and sample questions.) Each multiple choice question has four plausible responses. The test was designed to measure understandings and knowledge of basic geography concepts, principles, and skills. In general, each part of the test can be completed within a single class period as the estimated test completion time varies between 45-50 minutes. If a school wanted to use both parts of the test, two instructional periods would be needed to administer both parts of the test.

Each objective was measured by having students respond to 4 to 17 questions related to the specific content objective. The objectives selected for testing represent the "core" or "major" geography content needed to understand geography. In all probability most geographers and

geographic educators would agree that the 18 objectives are important and reflect important geographic knowledge and understandings. While there may be some ideological disagreement among geographers and geographic educators concerning the precise interpretation of each objective, in all likelihood a general consensus concerning the importance of these objectives could be attained.

The objectives selected to measure geographic understanding are the following.

1. GEOGRAPHY SKILLS (Part I) The student shall understand
   a. the characteristics of maps, globes, and remotely sensed data (air photos).
   b. and use scale to measure distance and area.
   c. and use direction reference systems (both absolute and relative) in order to read maps.
   d. and use map symbols and other map conventions.
2. CULTURAL GEOGRAPHY (Part I) The student shall understand
   e. the influence of people on the physical environment.
   f. the influence of economic activity on the environment.
   g. the influence of the physical environment on people.
3. PHYSICAL GEOGRAPHY (Part II) The student shall understand
   h. and define/describe major features of the physical environment.
   i. how features of the physical environment are formed.
   j. the relation of climate to the physical environment.

4. LOCATION RECALL ON MAPS (Part II) The student shall be able to locate...

k. important political units.

l. major cities.

m. major landforms.

n. major bodies of water.

o. major climate regions.

p. major religious, cultural, and language groups.

q. areas of major economic activity.

r. major soil types and vegetation areas.

The purposes and nature of the geography assessment test were intended to 1) establish some benchmark data in order to be able to make time line base comparisons when the test is again scheduled for statewide administration in about 5 years; 2) provide greater visibility for the 18 geography objectives as the "heart" or "core" of quality geography courses and programs throughout the curriculum; 3) identify strengths and weaknesses by objective in student knowledge and understanding of geography which in turn could provide direction for local curriculum development efforts [hard and valuable data would be available], 4) make the test available on a local option basis to other public and/or private schools to enable these schools to measure their students against the statewide assessment averages; 5) enable individual schools or individuals districts to compare the results of their students with the statewide results; and 6) measure attitudes of students concerning their study of geography and their experiences in geography as related to their performance on the test.

The results of the test suggest the test questions were on the whole somewhat difficult in that the overall student average on Part I was 69% and on Part II the average was 57%. To some extent the level of student performance exceeded the expectations of those who constructed the test who had expected average scores to range between 50%-60%. Overall student performance was highest on questions related to cultural geography and except for using scale to measure distance and area, students also did well on other geography skills. On the other hand, some weaknesses were identified as students scored lowest on questions related to location recall using maps especially with regard to maps of climate regions, and relgious, language and culture groups. These overall test score percentages are fairly consistent with other available national research data measuring geographic knowledge. (McKenzie, 1982; Bettis and Manson, 1975)

The number of test items and the average percent (rounded) of items correct for each objective are show in Table I which follows.

Table I. Performance Analysis Report

Geographic Objectives (abbreviated)	Number of Items	State Average
GEOGRAPHY SKILLS (Part I)		
Maps, globes, and remotely sensed data (air photos)	7	71
Scale to measure distance and data	7	56
Direction reference systems to read maps	10	67
Map symbols and other conventions	8	78

CULTURAL GEOGRAPHY (Part I)		
Influence of people on the physical environment	6	65
Influence of economic activity on the environment	14	70
Influence of the physical environment on people	9	70
TEST RESULTS FOR PART I		
Total Items Possible	61	
Average Number of Items Correct	42	
Average Percent of Items Correct		69
PHYSICAL GEOGRAPHY (Part II)		
Features and processes of the physical environment	17	59
How features of the physical environment are formed	8	51
Relation of climate with the physical environment	7	49
LOCATION RECALL USING MAPS (Part II)		
Major political units	14	61
Major cities	11	55
Major landforms	6	53
Major bodies of water	8	53
Major climate regions	4	44
Major religious, language, and cultural groups	5	45
Areas of major economic activity	6	50
Locate soil and vegetation areas	4	53
TEST RESULTS PART II		
Total Items Possible	90	
Average Number of Items Correct	51	
Average Percent of Items Correct		57

OVERALL TEST RESULTS

Total Items Possible		
Part I	61	
Part II	90	
Average number of items correct		
Part I	42	
Part II	51	
Average percent of items correct		
Part I		69
Part II		57

When the demographic data and student attitude questionnaires (see Appendix B) have been analyzed it will be possible to say much more about the status of geography instruction in Wisconsin. For example, the data will indicate the number of females and males taking the test and how well each gender performed on the test; the number of students who are taking (or have taken) a geography course; student perceived level of geographic understanding; student attitudes toward the study of geography; etc. After a careful examination of the data, then various recommendations concerning geography instruction can be made based on reliable and current data.

Tentative recommendations based on existing data might include the following (subject to revision when complete data become available):

1. Students enrolled in Wisconsin K-12 schools should be given regular and planned instruction in geography throughout all of their school years as related to the 18 objectives included on the test of geographic understanding. Implicit in these tentative recommendations is that elementary students be introduced to the basic geographic concepts and principles in a regular and systematic manner appropriate to their grade and maturity level.

2. On a planned and ongoing basis geography concepts, principles, and skills should be incorporated into other social studies, earth science, and environmental education courses throughout the K-12 curriculum as appropriate to course content, objectives, and the maturity level of the students.
3. At the secondary level a "capstone" or advanced study geography course should be offered and perhaps even required of all students. Such a course is needed in order for students to understand more effectively the principles of geography as they relate to and influence the various dimensions of our daily life.
4. Since students did not perform as well on location recall questions using map skills, perhaps greater attention and classroom instruction should be given to these objectives to enable students to improve their knowledge in these areas.

Wisconsin like other states is interested in determining what knowledge and understandings students have with regard to geography and geographic issues. It is difficult to compare Wisconsin student scores with those from other states since the purposes of state developed tests vary greatly, e.g., one state may have a geography test to determine minimum competency, while another state is interested in the mastery of geographic knowledge. Geographers and geographic educators in Wisconsin and elsewhere may well want to carefully review the Wisconsin test, its objectives, and the test results, and then make reasoned judgements concerning their own geographic education programs in relation to student knowledge and understanding.

It seems clear that geographers and geographic educators need to examine carefully state test results when writing textbooks, developing

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instructional materials, and presenting geographic information in their own classes. It would also seem important that the National Council for Geographic Education take a second, or even third look at its national tests and consider revising those tests as determined to be appropriate. Such a test will allow the gathering of precise information across the United States and will enable educators and the public to know how much geographic knowledge and understandings students have throughout the country. The data can help to identify areas of gaps and overlaps in geographic instruction. In addition, data generated by the various state geography tests as well as data from the NCGE national test should be helpful in identifying areas where students have inadequate or incorrect geographic knowledge which in turn should influence future geography curriculum development efforts and subsequent instructional practices at all educational levels from pre-school through the university level in the United States.

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APPENDIX A

DOMAIN I: GEOGRAPHY SKILLS

OBJECTIVE #1

The student shall understand the characteristics of maps, globes, and remotely sensed data (air photos)

CONTENT SPECIFICATIONS:

- All maps are representations and contain distortions; they simplify; they distort distances and shapes.

- Different projections serve different purposes.

- Remote sensing makes no use of symbols.

- Certain projections have particular types of distortion; e.g., conformal versus equal-area, cylindrical, polyconic. Show actual projections and ask students which areas are most distorted.

Do NOT ask students to identify projections by name.

SAMPLE QUESTION:

Satellite photographs are different from maps because the photographs

A. show political boundaries.
B. show only weather patterns.
C. contain the names of physical features.
*D. make no use of symbols.

OBJECTIVE #2

The student shall understand and use scale to measure distance and area.

CONTENT SPECIFICATIONS:

- All maps have a scale.

- Not all maps are of the same scale.

- Students should be able to read a scale and determine distance.

- Students should be able to read a scale and determine area.

- Students should know the difference between the concepts of large and small scale.

- Students should understand the relationship between scale and the degree of detail.

SAMPLE QUESTION:

Features such as rivers or landforms would be shown in greatest detail on a map with a scale of:

*A. 1 inch = 1/2 mile.
B. 1 inch = 1 mile.
C. 1 inch = 100 miles.
D. 1 inch = 1000 miles.

OBJECTIVE #3

The student shall understand and use direction reference systems (both absolute and relative) to read maps.

CONTENT SPECIFICATIONS:

- Absolute measures are based on a grid system (such as longitude, latitude, atlas grid (A10), etc.).

- Relative measures of distance are based on distance and direction from a known point (e.g., Dodgeville is 40 miles southwest of Madison).

- The orientation of maps is a matter of convention (e.g., north is not necssarily up on a map).

- Different systems of geographic measurement are used (e.g., time, gasoline consumption, etc.).

- Students should be able to define such concepts as latitude, longitude, township, range, etc.

SAMPLE QUESTION:

If a map has east at the top of the page, where would north be located?

A. top of the page.
*B. left side of the page.
C. right side of the page.
D. bottom of the page.

OBJECTIVE #4

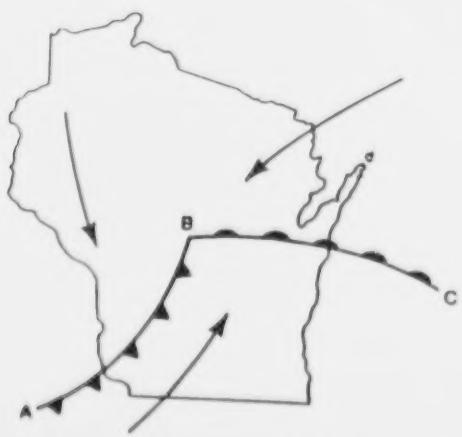
The student shall understand and use map symbols and other conventions.

CONTENT SPECIFICATIONS:

- Students should be able to define a variety of symbols and conventions, including the following: contour lines, graded system of city symbols, cold and warm fronts, roads, railroads, water symbols, road map symbols, color, etc.

- Students should be able to identify the symbols noted above and use them to read/interpret maps. Greater than and less questions are appropriate.

SAMPLE QUESTION:



On the map above, what does the line from A to B represent?

A. thundershowers.
B. a stationary front.
C. a warm front.
*D. a cold front.

DOMAIN II: PHYSICAL GEOGRAPHY

OBJECTIVE #5

The student shall be able to define/describe major physical types and features of the environment.

CONTENT SPECIFICATIONS:

- This objective tests students' ability to define/describe major elements of the physical environment such as landform types, river systems/watersheds, deserts, climate regions, water bodies (e.g., seas, oceans, lakes).

SAMPLE QUESTION:

Which of the following usually brings cool and clear weather to Wisconsin?

A. low pressure system.
*B. high pressure system.
C. occluded front.
D. southwest winds.

OBJECTIVE #6

The student shall understand how major features of the physical environment evolve.

CONTENT SPECIFICATIONS:

- This objective tests students understanding of such processes as tectonics, volcanism, erosion, deposition (including glaciation, water, and wind), climate, weather, vegetation, soil pattern, etc.

SAMPLE QUESTION:

U-shaped valleys found in mountainous regions reflect the influence of:

*A. glaciation.
B. wind erosion.
C. deposition.
D. vulcanism.

OBJECTIVE #7

The student shall understand how elements of the physical environment relate to one another.

CONTENT SPECIFICATIONS:

- The student should understand the general relationships, among components of the physical environment, including landforms, climate, vegetation, soil, and water.

- Questions should be of two broad types:
  A. How climate affects vegetation, soils, and landforms.
  B. How water, altitude, latitude, and landforms affect climate

SAMPLE QUESTION:

Quito, Equador has a relatively cool climate compared to other cities located on the equator. The best explanation is that Quito is:

A. at sea level.
B. in a thick forest area.
C. usually cloudy.
*D. at a higher altitude.

DOMAIN III: CULTURAL GEOGRAPHY

OBJECTIVE #8

The student shall understand the impact that population has on selected elements of the environment, including the physical environment, economic activity, the material culture, and non-material culture.

CONTENT SPECIFICATIONS:

- Population includes location, numbers, densities, patterns, age, sex, birth rates, and death rates.
- Economic activity includes production, distribution, and consumption in various historical and cross-cultural cases.
- Non-material culture includes values, beliefs, and languages of a people.
- Material culture includes rural and urban forms and patterns of settlement and transportation.

SAMPLE QUESTION:

A group of people whose values and attitudes show little change probably:

A. has higher living standards than the rest of the world.
B. lives in larger cities.
C. engages in international trade.
*D. has been isolated from others.

OBJECTIVE #9

The student shall understand the impact that economic activity has on selected elements of the environment, including the physical environment, population, the material culture, and non-material culture.

CONTENT SPECIFICATIONS:

- See above -- identical to objective #8

SAMPLE QUESTION:

A major reason for the spread of the English language around the world is:

A. the establishment of European religions overseas.
B. the need for airline pilots to speak a common language.
* C. western technology and trade patterns after World War II.
D. the fact that English is very easy to learn.

OBJECTIVE #10

The student shall understand the impact that the physical environment has on selected elements of the environment, including the population, economic activity, the material culture, and non-material culture.

CONTENT SPECIFICATIONS:

- See above -- identical to objective #8

SAMPLE QUESTION:

Early settlers on the North American Great Plains built houses of sod because:

A. the settlers were not accustomed to building with wood.
B. sod offered greater protection than wood from the heat and cold.
*C. sod was readily available as a building material.
D. the settlers had built sod houses before coming here.

DOMAIN IV. LOCATION RECALL

OBJECTIVES:

On a given map, the student shall be able to locate

11. important political units
12. major cities.
13. major landforms.
14. major bodies of water.

15. major climate regions.
16. major religious, language, or cultural groups
17. areas of major economic activity.
18. major soil types asnd vegetation areas.

CONTENT SPECIFICATIONS:

- Several different projections covering the five major areas of the world should be used: 1) the Americas; 2) Asia; 3) Europe; 4) Africa and the Middle East; and 5) Australia, New Zealand, and Antarctica.

- World map projections, as well as projections of selected areas, should be used.

- Comparison questions are appropriate, as well as recall of place locations.

- Items about Wisconsin should be included.

SAMPLE QUESTIONS:

Note: Sample questions related to objectives #11-18 all require the use of specific maps which are not reproduced here. The questions require the students to locate specific places or identify specific areas on maps of different world regions and projections.

APPENDIX B

Student Questionnaire

So that we can better understand the results of the statewide geography assessment, please take a few minutes and answer the following questions. Answer all questions honestly. We assure you that all replies will be kept confidential.

MARK YOUR RESPONSES ON THE ANSWER SHEET, NOT IN THIS BOOKLET.

A. During junior high or middle school (grades 6-8), did you take a course in geography?

1. Yes
2. No

B. During high school (grades 9-12), did you take a course in geography?

1. Yes
2. No

For questions C, D, and E below, indicate how important school, travel, and television are for <u>your</u> understanding of geography:

C. School

1. <u>Not</u> very important
2. About average in importance
3. <u>Very</u> important

D. Travel

1. <u>Not</u> very important
2. About average in importance
3. <u>Very</u> important

E. Television

1. <u>Not</u> very important
2. About average in importance
3. <u>Very</u> important

F. Compared to other subjects you have studied, how do you feel about the study of geography?

1. It is one of my least favorite areas of study.
2. It is about as interesting as other areas of study.
3. It is one of my favorite areas of study.

G. Which statement best describes your understanding of how to read and use maps?

1. I feel that I have a good understanding.
2. I feel that I have a fair understanding.
3. I feel that I have a poor understanding.

H. Which statement best describes your understanding of the ways that people live in other countries?

1. I feel that I have a good understanding.
2. I feel that I have a fair understanding.
3. I feel that I have a poor understanding.

I. Which statement best describes your understanding of such topics as weather and climate, vegetation and soils, formation of landforms, etc.?

1. I feel that I have a good understanding.
2. I feel that I have a fair understanding.
3. I feel that I have a poor understanding.

J. Which statement best describes your understanding of the location of cities, lakes, rivers, countries, etc.?

1. I feel that I have a good understanding.
2. I feel that I have a fair understanding.
3. I feel that I have a poor understanding.

K. In your opinion, did you have enough opportunity to study and learn about geography during grades 6-12?

1. Yes
2. No
3. Not Certain

L. Do you plan to go to college or technical school after you graduate from high school?

1. Yes
2. No
3. Not Certain